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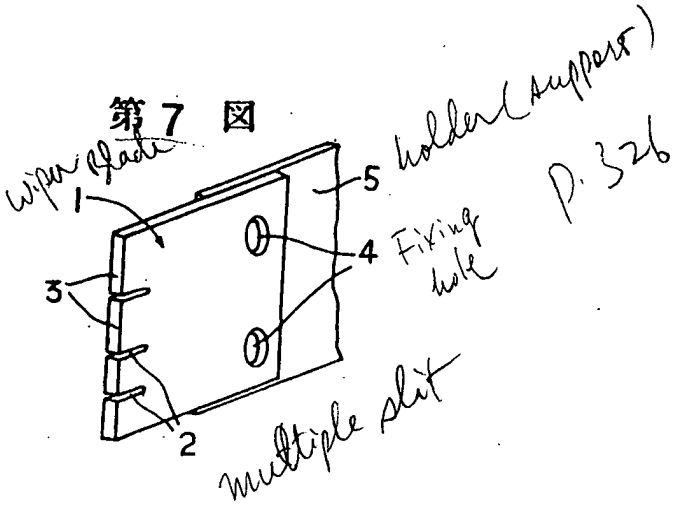

WIPER BLADE OF INK-JET RECORDING DEVICE

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WIPER BLADE OF INK-JET RECORDING DEVICE

[Inku jetto kiroku sochi no waipa buredo]

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[There are no amendments to this patent.]

Claim /1*

A wiper blade of an ink-jet recording device, characterized by the fact that in a wiper blade of an ink-jet recording device having a slit at an operating end of the blade, the shape and the width of the above-mentioned slit become fine toward the above-mentioned operating end and are selected with values that exert sufficient capillary force for holding ink and a flexibility suitable for wiping foreign matter on a jet port surface.

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* [Numbers in the margin represent pagination of the original text.]

Detailed explanation of the invention

Industrial application field

The present invention pertains to a wiper blade being installed to clean the jet port surface of a recording head in an ink-jet recording device.

Prior art

Recording devices such as printers, copying machines, and facsimiles are constituted to record an image consisting of dot patterns on a recording medium such as paper and a plastic thin plate based on image information being transferred.

The above-mentioned recording devices can be divided into an ink-jet type, wire dot type, thermal type, laser beam type, etc., and among them, the ink-jet type (ink-jet recording device) jets and puts into flight liquid drops (recording liquid such as ink) from a jet port of a recording head and records them by attaching them to a recording medium.

This ink-jet recording device is a non-inverting recording device, and since little noise is present, high-speed recording is easy, and if a polychromatic ink is used, color image recording is also easy. Thus, this ink-jet recording device has been widely provided in recent times.

In the above-mentioned ink-jet recording device, moisture included in the recording liquid (ink) and recording medium is evaporated, and condensation is sometimes generated on the jet port surface (face opposite to the recording medium of the recording head), on which an ink-jet port is formed, depending on the recording head, the humidity of the atmosphere, and other conditions. /2

Also, moisture is generated on the jet port surface of the recording head by spring-back of the jet ink from the recording medium.

If the above-mentioned condensation or moisture is generated, water drops nonuniformly attach onto the jet port surface, and when jetting and separating a jet ink, the jet ink is pulled out by the water drops, the jet direction and the jet speed of the ink are changed, or scatter occurs in the particle diameter of the liquid drops (ink drops), so that the recording quality is lowered.

Also, paper powder, dust, etc., are likely to attach by wetting of the jet port surface, so that the recording quality is sometimes lowered.

As a means to prevent these phenomena, a wiper that uses a flexible wiper blade and removes condensation, moisture, dust, etc., by wiping the jet port surface with said wiper blade is adopted.

Figures 6 and 7 are respectively oblique views showing the shapes of wiper blades in conventional wipers.

In the conventional wiper blade 1 shown in Figure 6, the surface of the other member (the jet port surface of the recording head) is wiped and cleaned while contacting it with a linear operating end (wiping end) 3.

In Figure 6, 4 shows holes for fixing the wiper blade 1 and 5 is a holder for supporting said wiper blade 1.

Also, in the conventional wiper blade 1 of Figure 7, several slits 2 are installed at the operating end 3 in the structure of Figure 6, so that the followability during wiping can be improved.

Technical problems to be solved by the invention

However, in the above-mentioned conventional wire blades (especially the wiper blade having no slits 2 of Figure 6), since the followability to the other member is poor and a wiping trace remains on the jet port surface of the recording head as the other member, an abnormality is caused in the ink-jet, and shifting, non-jetting, satellite splashing, etc., in the liquid drop flying direction result.

Also, in the wiper blade having the linear operating end 3 as shown in Figure 6, since the entire blade is vibrated by projections and recessions in the vicinity of the jet port surface, splashing onto the wiper blade 1 occurs at the position where cleaning is required, so that wiping traces remain, or the wiped-out ink springs back and is dispersed to the periphery. Thereby, the recording device inside is contaminated, or the recording medium such as paper is stained.

The splashing of the wiper blade 1 can be prevented by lowering the speed during wiping; however a decrease in throughput and a complication in the operation result.

Also, a means for collecting the ink in flight is installed; however this is disadvantageous in terms of performance and cost.

Accordingly, as shown in Figure 7, installing slits 2 at the operating end 3 of the wiper blade 1 has been proposed.

However, if slits 2 are formed, the slit width is limited in terms of working performance, and the wiper functions, working performance, cost, etc., are significantly changed at a certain width (for example, about 1.0 mm).

In other words, if the width of the slits 2 is increased, the portion of said slits is not wiped, and when the recording head is moved, recording liquid, dust, etc., left on the jet port surface are shaken off and attached to the recording medium or drop on electric parts and functional parts in the recording device, so that functional inferiorities result.

Also, the ink held in said slits by a capillary force dependent on the width of the slits 2 is simply put into flight by a slight impact or vibration since the holding force is small, so that an adverse effect frequently results.

However, if the slits are wide, there are advantages such as easy working, high productivity, and good followability, but functions of a blade having no slits are rendered to other parts, or a wide blade with relatively wide slits is adopted with the combination of a control method means in many cases.

On the other hand, in the wiper blade 1 as shown in Figure 7, if the slits 2 are narrow and /3
the slits have only the tooth width (cut) of a cutter, almost all of the above-mentioned problems can be solved, so that the desired performance can be exerted. However, the following problems result.

First, a workability problem results.

In other words, if an elastic member having narrow slits is formed at low cost, generally, it is punched out by a pick type cutter, but if slits with a width of 1 mm or less are formed, a punching gas treatment and a cutter edge shape measurement are difficult in terms of durability and workability of a mold.

Accordingly, a slit for inserting the above-mentioned cutter edge is formed; however in such a slit, "self-adhesion" (a phenomenon in which adherence to the cut surface occurs) results on the cut surface, so that the slit function is sometimes lost.

In other words, in a narrow slit, even if difficult working is applied, "self-adhesion" results after the working, so that the result is the same as when no slit is present.

As conditions required for the elastic material used in the above-mentioned wiper blade 1, various mechanical properties that are not greatly dependent on the temperature are required in addition to bending durability and wear resistance, since the jet port surface is wiped.

Also, physiochemical stability characteristics such as chemical resistance, non-dissolution property in a solvent, ink non-erosion property, and stable jetting characteristics or no shortening of life due to a change in the characteristics of ink by dissolved components are required.

Materials that meet these requirements are limited to elastic materials such as NBR, SBR, silicone, and urethane.

In consideration of cost, etc., a butyl rubber group material is selected from these materials.

However, such rubber easily "self-adheres," the desired characteristics cannot be exerted, and the slit width extends during working. At the same time, the wiping speed is reduced, or contact with the jet port surface slowly increases. Also, the wiping function is sacrificed to some degree, and the practicality is difficult unless a complicated wiping operating control method is added.

The present invention considers the above-mentioned conventional technical problems, and its objective is to provide a wiper blade of an ink-jet recording device that has an excellent

wiping retention function for foreign matter such as ink from a jet port surface, can prevent flying of ink, etc., can easily control the wiping operation, is easily worked, can raise productivity, and can reduce cost.

Means to solve the problems

The present invention solves the above-mentioned functional and working problems by installing a tapered part at the tip of a slit.

In other words, the present invention is characterized by the fact that in a wiper blade of an ink-jet recording device having a slit at an operating end of the blade, the shape and the width of the above-mentioned slit become fine toward the above-mentioned operating end and are selected with values that exert sufficient capillary force for holding ink and a flexibility suitable for wiping foreign matter on a jet port surface. With this constitution of the wiper blade of the ink-jet recording device, since the wiping retention function of foreign matter such as ink is excellent and flying of ink, etc., can be prevented, the wiping operation can be easily controlled, working is easy, the productivity can be raised, and the cost can be reduced.

Application examples

Next, the present invention will be explained in detail referring to Figures 1-5.

Figure 5 is a plan view showing the main parts of an ink-jet recording device suitable for using the wiper blade of the present invention. In the figure, 11 is an ink-jet recording head, and in said ink-jet recording head 11, an ink-jet port group for recording an image by jetting liquid drops to a recording surface of a recording medium 12 such as paper, plastic thin plate is formed in a prescribed array.

13 is a carriage for holding the above-mentioned recording head 11, and said carriage 13 is connected to part of a driving belt 14 and is guided and supported in a sliding way along two parallel guide shafts 15A and 15B.

The above-mentioned carriage 13 can be controlled by reciprocating the recording head 11 over essentially the entire width of the recording medium 12.

16 is a recording head recovering device arranged at a prescribed position other than the recording area in a moving path of the recording head 11, for example, at a position opposite the home position, and a cap part 16A for capping the jet port surface of the recording head 11 is installed in front of said recording head recovering device 16.

The recording head recovering head 16 is driven in an approaching and separating direction to and from the recording head 11 by a motor and a transmission mechanism not shown in the figure and caps the jet port surface of the recording head 11 at an approaching and separating position.

In relation to the capping of the recording head 11 by the cap part 16A of the recording head recovering device 16, ink is absorbed by a suction means installed in the recording head recovering device 16, or ink is press-fed by a pressurization means installed in an ink supply passage into the recording head 11, so that the ink is forcedly discharged from the ink-jet port. Thereby, a jet recovery treatment for removing tackified ink in the ink outlet (in the liquid passage) bubbles in the ink is carried out.

Also, the recording head 11 is protected by capping the jet port surface when recording is finished, etc.

17 is a wiping means installed at the side part of the above-mentioned recording head recovering device 26 [sic; 16].

In the example shown in the figure, the wiping means 17 consists of a plate-shaped wiper blade 18 made of an elastic material such as rubber and a holder 19 for connecting said wiper blade 18 to the above-mentioned recording head recovering device 16.

Therefore, the above-mentioned wiper blade 18 can be moved along with the movement of the recording head recovering device 16 so that it may be protruded and retreated.

The above-mentioned wiper blade 18 is formed of a butyl rubber group or silicone rubber group rubber-shaped elastic material.

Thus, the wiper blade 18 is protruded into the moving path of the recording head 11 at an appropriate timing such as during the recording operation of the recording head 11 or after a jet recovery treatment of the recording head recovering device 16, and condensation, moisture, or dust on the jet port surface of the recording head 11 can be wiped along with the reciprocating operation of the recording head 11.

Figure 1 is a side view showing a first application example of the wiper blade 18 of the present invention.

In Figure 1, mounting holes 4 for fixing the above-mentioned holder 19 are formed in the base part of a wiper blade 18, and a slit 22 is formed at an operating ends (the end edge part of the wiping side of the jet port surface).

The slit 22 has a necessary length L and a maximum width W, and a closed end 22A has a bent shape to prevent stress concentration or damage during working.

On the other hand, at the operating end 3 (wiping operating end) of the slit 22, a tapered part 22B in which the slit width is reduced toward the end edge is formed.

In this case, the minimum width w of the slit 22 of the operating end is fixed at a minimum size near the working limit, and the normal width (same as the maximum width in the example shown in the figure) W of the above-mentioned slit 22 is selected for easy working.

As a detailed example, the material of the wiper blade 18 is butyl rubber and has a thickness t of 0.5 mm, a height H of 25 mm, and a width B of 1.5 mm. As an example, the

above-mentioned slit 22 can be selected to have a length L of 3 mm, a width W of 1.5 mm, and a minimum width w of about 0.3 mm.

According to the above constitution, compared with the case where a slit with a minimum width is formed over the entire length L, the workability and the durability of a slit molding mold can be significantly improved.

Also, as a function of the slit 22, since the operating end is narrowed, hardly any wiping trace due to the slit opening width is present, and a capillary force effect is also sufficiently obtained, so that flying of ink absorbed and held in the slit 22 by vibration or impact during the wiping operation can be reliably prevented.

Furthermore, when the jet port surface is wiped, the ink remaining at the jet port surface can be pumped up by the above-mentioned powerful capillary force, so that a complete cleaning without a wiping trace can also be realized by a minimum number of wiping repetitions.

Also, since most of the slit 22 is formed at an easy working width W, punching gas treatment is easy, and the productivity can also be easily improved by automation.

Thus, a wiper blade of an ink-jet recording device that can sufficiently exert the functions of a slit and can also improve the workability and the productivity can be obtained.

Figure 2 is a side view showing a second application example of the wiper blade of the present invention.

In Figure 2, parts corresponding to each part of Figure 1 are also shown by the same symbols.

In this application example, a circular slit 22 is formed at operating end 3 of a wiper blade 18, and the shape and the arrangement of said slit 22 are selected so that the operating end 3 of the wiper blade 18 may be part of a tangent line on the circular arc of said slit 22.

Figure 3 is a side view showing a third application example of the wiper blade of the present invention. In this application example, the shape of a slit 22 is changed from the circular shape of Figure 2 to an elliptic shape.

In Figure 3, the elliptic slit 22 major axis is essentially at a right angle to operating end 3, and similarly to the case of Figure 2, the operating end 3 of wiper blade 18 is arranged so that it may be part of a tangent line on the circular arc of said slit 22.

The other parts of this application example have substantially the same structure as the case of Figure 2.

According to each of the above application examples shown in Figures 2 and 3, compared with the application example of Figure 1, the capillary force of the slit 22 tends to be slightly weaker, however an operating effect similar to the above-mentioned effect of the application example of Figure 1 can be obtained.

Figure 4 is a side view showing a fourth application example of a wiper blade 18 of the present invention.

In this application example, an opening (an elliptic opening in the example shown in the figure) 22C with a prescribed size is formed at a small spacing s (for example, about 0.5 mm) from operating end 3 of the wiper blade 18, and a "self-adhesion region" 22D consisting of a slit for a cutter cutting is installed in a limited region of the spacing s, so that a slit 22 is constituted.

In other words, in this application example, with the installation of the self-adhesion region (the silt part being adhered) 22D with a slight length s, the capillary force is improved, and the length s of said self-adhesion region 22D is limited, so that slit 22 in which the self-adhesion force is suppressed to a fixed level or less is formed.

In this case, the above-mentioned spacing s is preferably selected so that its self-adhesion will be broken by a repulsive force received from the jet port surface during the wiping operation.

Also, with the application of an appropriate treatment to the cut surface of the above-mentioned self-adhesion region 22D, "self-adhesion" may not result.

For example, an ink solvent film is formed on the cut surface of the self-adhesion region 22D by washing in an ink solvent, or fine projections and recessions are formed on the surface of the above-mentioned cut surface by a plasma treatment, so that the above-mentioned self-adhesion can be prevented.

Also, a mold release agent is sometimes spread on the above-mentioned cut surface, so that the above-mentioned self-adhesion can be prevented.

In the application example explained by Figure 4, similarly to the above-mentioned application examples explained in Figures 1-3, compared with the case where a slit with a minimum width is formed over the entire length of the slit 22, the workability and the durability of a slit molding mold can be largely improved, and a sufficient capillary force for removing wiping traces of the slit opening part and reliably holding the wiped ink is obtained, so that flying of the ink (absorbed and held in the slit 22 by wiping) by vibration or impact during the operation can be reliably prevented. Furthermore, when wiping the jet port surface, the ink /6
remaining in the jet port surface can be pumped up by a powerful capillary force, so that a complete cleaning without wiping traces can also be realized by a minimum number of wiping repetitions.

Furthermore, a punching gas treatment of the slit 22 is easy, and the productivity can also be easily improved by automation.

Thus, in the application example of Figure 4, similarly to the above-mentioned application examples, a wiper blade of an ink-jet recording device that can sufficiently exert the

functions of a slit and can also improve the workability and the productivity can also be obtained.

Effect of the invention

As seen from the above explanation, according to the present invention, in a wiper blade of an ink-jet recording device having a slit at an operating end of the blade, the shape and the width of the above-mentioned slit become fine toward the above-mentioned operating end and are selected to values with exert sufficient capillary force for holding ink and a flexibility suitable for wiping foreign matter on a jet port surface. With this constitution, since the wiping retention function of foreign matter such as ink is excellent and flying of said ink, etc., can be prevented, a wiper blade of an ink-jet recording device that can easily control the wiping operation, is easily worked, can raise the productivity, and can reduce the cost can be provided.

Brief description of the figures

Figure 1 is a schematic side view showing a first application example of the wiper blade of an ink-jet recording device of the present invention. Figures 2, 3, and 4 are respectively schematic side views showing second, third, and fourth application examples of wiper blades of an ink-jet recording device of the present invention. Figure 5 is a schematic partial plan view showing the main parts of an ink-jet recording device suitable for using the wiper blade of the present invention. Figures 6 and 7 are respectively schematic oblique views showing conventional wiper blades of an ink-jet recording device.

Next, symbols showing the main constitutional parts of the figures will be provided.

3 Operating end (wiper blade)
11 Recording head
12 Recording medium
13 Carriage
17 Wiping means
18 Wiper blade
22 Slit
22A Tapered part (slit)
22C Opening (slit)
22D Self-adhesion region (slit)

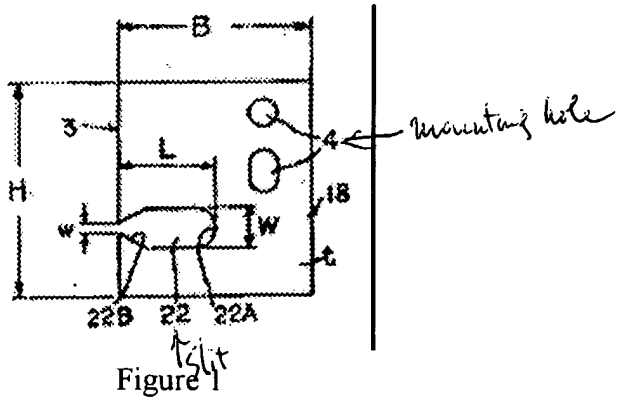

Figure 1

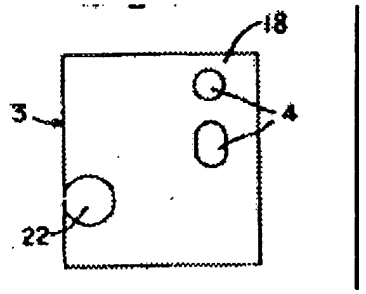

Figure 2

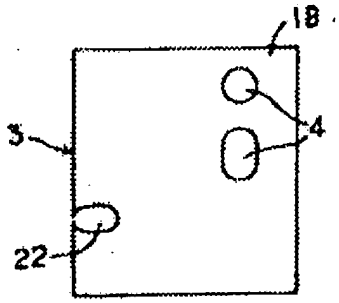

Figure 3

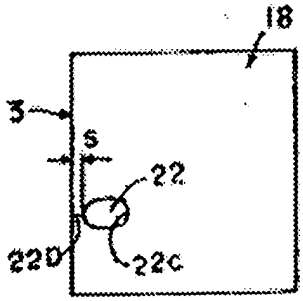

Figure 4

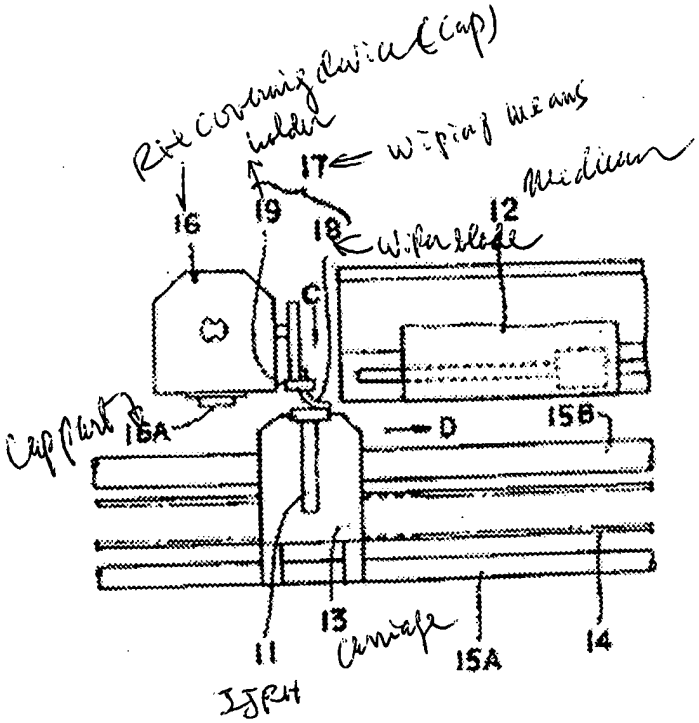

Figure 5

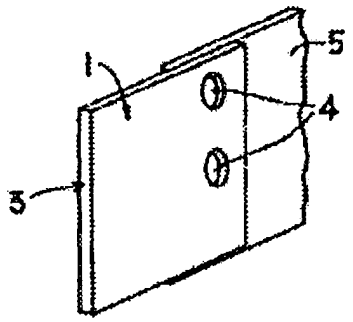

Figure 6

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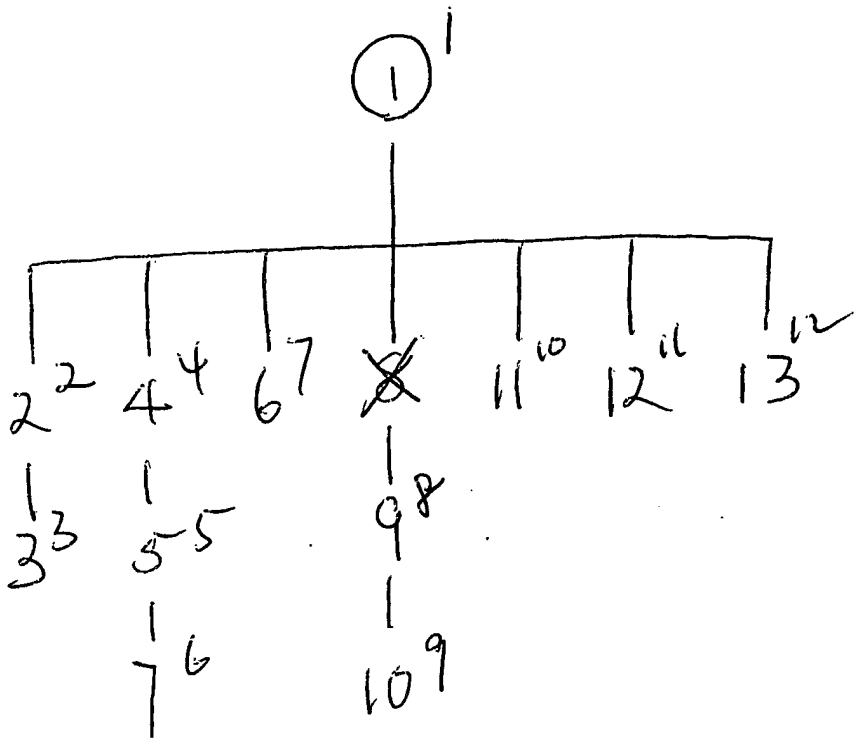

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